

Wendler Glottoplasty: An Effective Pitch Raising Surgery in Male-to-Female Transsexuals

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Summary: Objectives. Evaluation of the voice results after Wendler glottoplasty in male-to-female transsexuals (MFTs).

Study Design. Retrospective case series.

Methods. We retrospectively reviewed 31 MFT patients treated with a Wendler glottoplasty technique. The procedure consists of the CO₂-laser de-epithelialization of the anterior commissure along with the anterior third of the two vocal folds, the suturing of the two vocal folds with two 3.0 resorbable threads, and next, the application of fibrin sealant to strengthen the stitches. Voice assessment was based mainly on fundamental frequency, frequency range, maximum phonation time, phonation quotient, estimated subglottic pressure (ESGP), grade of dysphonia (G), and voice handicap index. The measurements were performed preoperatively and on the last follow-up visit and compared using *IBM SPSS 20* statistical package (IBM Corp, Armonk, NY). The patients have been divided in two groups (group A younger than 40 years and group B of or older than 40 years) for assessing the influence of the age of treatment on the results.

Results. Group A included 19 individuals with mean age of 28.6 years (range: 16–39 years) and group B included 12 individuals with mean age of 51.9 years (range: 45–59 years). The mean follow-up period was 9.2 months. Three cases had previously undergone a cricothyroid approximation elsewhere. We found a significant improvement of mean F_0 from 135.8 to 206.3 Hz in total ($P = 0.001$) and also in both groups, especially in group A (mean F_0 -postop = 213.8 Hz). The mean frequency range had a tendency to decrease postoperatively, whereas the ESGP was significantly higher in both total sample and group A ($P = 0.001$, respectively). G was increased postoperatively and presented a statistical significance in group B ($P = 0.035$). A revision Wendler procedure was necessary for three individuals (9.7%); two of them presented a suture's line breakdown because they did not follow the postoperative recommendations for voice rest and the third one had an insufficient web due to an insufficient estimation of the necessary correction.

Conclusion. Wendler glottoplasty seems to be an effective technique to feminize the voice in MFTs with better results when performed in younger individuals.

Key Words: Male-to-female transsexual–Wendler glottoplasty–Voice feminization.

INTRODUCTION

Transsexualism is a complex condition of gender identity, in which the individuals believe that their psychological gender is contrasting to the anatomic one. The majority of transsexuals (75%) are being males desiring to be reassigned as females (male-to-female transsexualism [MFT]).¹ Nowadays, transsexuals are more socially acceptable and seeking more easily medical assistance than in the past. The transformation process of MFT is complex and usually includes many steps, as evaluation by mental health professional, medical and hormonal replacement therapies, many cosmetic and reconstructive surgeries, and behavioral changes before feminization. Many of them have undergone sex reassignment before seeking an otolaryngologist's opinion.²

Despite all the aforementioned interventions, MFT individuals frequently report discomfort with their masculine-

sounding voices. Although voice may be considered as a secondary sexual characteristic, actually it is an important gender marker. Attaining a feminine voice is an imperative component to the overall gender transition process of MFT individuals.

Vocal pitch is the most basic sex-specific characteristic of the voice and females generally have higher fundamental frequency (F_0) than men.³ Contrary to testosterone therapy in female-to-male transsexuals that deepens the vocal pitch, estrogens administrations to MFTs in adulthood have no effect on the vocal folds or laryngeal structure and so these individuals maintain an anatomically male larynx.⁴ Speech therapy can be efficient in raising functionally the pitch and feminizing the voice as well as the vocal behavior by changing breathiness, intonation, articulation, word choice, and inflection. Nevertheless, the male voice reappears in uncontrolled situations, such as yawning, coughing and sneezing, and laughing.² The wish of MFTs is a naturally feminine voice rather than continuous acting efforts to sound feminine, which may lead to functional and organic voice pathology.⁵ Indeed, the voice in many cases gives the impression of hyperfunctional dysphonia and produces subjective complaints such as hoarseness, globus feeling, and vocal fatigue.⁶ Thus, surgery to achieve a higher F_0 is an alternative.

Many surgical procedures have been proposed for raising the voice pitch. The most well-known method is the cricothyroid approximation (CTA) according to Isshikki et al⁷ (Isshiki type

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IV thyroplasty). Wendler⁸ in 1990 described a fully transoral technique aiming at long-term results. We published the first article on this technique with very promising results.⁵ One of the main questions with this type of procedure is to know if performing the surgery in an early age can lead to better results. Therefore, in the present study, we divided our series in two groups, younger than and older than 40 years of age to assess the effect of age on the voice outcome. This age limit between the two groups is empirical and was based mainly to the clinical observation that patients who decide in their 40s or later that are psychologically female have developed all over the year the body and the attitudes of a mature male person.

PATIENTS AND METHODS

We retrospectively reviewed the records of all consecutive individuals treated in the Department of Otolaryngology & Head and Neck Surgery of the Louvain University Hospital of Mont-Godinne, between January 2009 and June 2012. All operations were performed by the same surgeon (M.R.) using Wendler technique with minor modifications.

Patients' data

Thirty-one MFTs individuals were included in our study with a mean age of 37.6 years (range: 16–59 years). According to the design of the study, the sample was separated in two subgroups according to age: group A included 19 individuals younger than 40 years (mean: 28.6, range: 16–39 years) and group B included 12 individuals older than 40 years (mean: 51.9, range: 45–59 years). Seven (22.6%) of them were smokers (five in the group A and two in the group B) and four (14.2%) were professional voice users (one in the group A and three in the group B). All individuals had started speech therapy before surgery and all but two resumed speech therapy after the vocal rest period of 10 days. The mean follow-up period was 9.2 months for the patients who could complete a regular follow-up. Table 1 shows the breakdown of the patients.

All individuals gave their informed consent before their inclusion in the study. The study received the approval of the ethics committee of the Louvain university hospital of Mont-Godinne.

Surgical procedure

The procedure was performed under general anesthesia with jet ventilation. The endolarynx was exposed through a rigid suspension laryngoscope. The anterior part of the vocal folds was de-epithelialized using the CO₂ laser with AcuBlade system (Lumenis, Santa Clara, CA) with 10-W intensity, continuous wave, repeat mode with a delay of 0.1 seconds, and a 2-mm wide circular beam. Care was taken not to injure the vocal ligament. The corresponding tissue of the vocal folds was firmly sutured to obtain a V-shaped anterior commissure. We used a laparoscopic forceps to maintain the needle and a knot pusher (Ethicon, Somerville, NJ) to secure the suture. Four 3.0 resorbable threads, two for each vocal fold, were needed. One thread was passed through the vocal ligament at the junction between the anterior and the middle third. The second was passed more anteriorly to the first. The same procedure was performed on the

contralateral fold. The anterior thread was ligated together through one knot inferior to the glottic plane and one knot superior to the glottic plane. The same procedure was performed for the more posterior two threads. At the end of the procedure, fibrin glue was used to strengthen the suture (Figure 1A–D). Adam's apple reduction procedure was performed when requested.

Postoperative care

A 10-day complete vocal rest period was recommended. This vocal rest period is empirical but is supposed to limit the tension forces and so to prevent the dehiscence of the stitches. We also encouraged cessation of smoking and an appropriate voice therapy. Patients were treated with antibiotics (amoxicillin + clavulanic acid: 1 g three times daily) for 1 week, double-dose proton pump inhibitors for 6 weeks, and inhaled steroids twice daily for 1 week. During the follow-up visits, videolaryngostroboscopy was performed and the larynx was inspected for edema, scarring, persistence of the suture material, and quality of vibration. Normal voice use and speech therapy were resumed after healing and obtaining of the anterior web (Figure 2).

Voice assessment

Pre- and postoperative voice data were available for 17 of 19 individuals in group A and in all the 12 individuals in group B. Voice evaluation was based on F_0 (Hz), frequency range (Hz), maximum phonation time (MPT; normal range 20–25 seconds), phonation quotient (PQ, mL/s, ie, the ratio obtained by dividing the vital capacity by the MPT), and estimated subglottic pressure (ESGP, hPa). All acoustic measurements were made with the use of *Multi-Dimensional Voice Program (MDVP)* (Kay Elemetrics Corporation, Lincoln Park, NJ). The estimated subglottic pressure is measured intraorally using the Kay electrometric pressure software and device (KayPENTAX Phonatory Aerodynamic System, model 6600 [KayPENTAX Corp, Montvale, NJ]). The mean pressure is calculated on the first micro-seconds while the patient says three times the sound “pa.” When the measurement is performed that way, the intraoral pressure is considered similar to subglottic pressure at the opening of the folds. For normal intensity and usual pitch, ESGP has been found to be around 7 hectopascals (hPa) in control subjects.⁹

Self-evaluation of voice by the patients included Voice Handicap Index (VHI) questionnaire,¹⁰ which takes into account the physical, functional, and emotional impact of the voice disorder and consists of 30 questions, each rated from 0 to 4, according to the severity of symptoms. Perceptual voice quality was evaluated by the physician with the grade (G) of dysphonia according to the GRBAS (*Grade, Roughness, Breathiness, Asthenia, Strain*) Hirano scale¹¹ which is the most frequently used scale for subjective voice analysis in daily practice. Voice measurements were made postoperatively at the first follow-up visit, at 2 months after the operation, then at 6 months, and finally at 2 years. However, some individuals did not follow strictly the scheduled follow-up program. Thus, we report the results of the preoperative and last follow-up visit.

TABLE 1.
Breakdown of Patients

MFTs	Age	Smoke	Professional User	Previous Voice Feminization Operations	Type of Surgery	Revision Procedure
Group A (<40 y)						
1	39	Y	N	N	Wendler	N
2	39	Y	N	N	Wendler	N
3	39	N	N	N	Wendler + RAA	N
4	29	N	N	N	Wendler	N
5	23	Y	N	N	Wendler + RAA	N
6	18	N	N	N	Wendler + RAA	N
7	26	N	N	N	Wendler	N
8	38	N	Y	Thyroplasty IV	Wendler	N
9	21	N	N	N	Wendler + RAA	Wendler (no voice rest—no voice therapy postoperatively—breakdown of suture line)
10	37	N	N	N	Wendler	N
11	28	N	N	N	Wendler	N
12	29	N	N	N	Wendler	N
13	25	N	N	N	Wendler	N
14	28	Y	N	Thyroplasty IV	Wendler	Wendler (insufficient web)
15	16	N	N	N	Wendler + RAA	N
16	31	N	N	N	Wendler + RAA	N
17	23	N	N	N	Wendler + RAA	N
18	18	N	N	N	Wendler + RAA	N
19	37	Y	N	Thyroplasty IV	Wendler-granuloma excision	N
Group B (>40 y)						
20	57	N	Y	N	Wendler	N
21	51	Y	N	N	Wendler	Wendler (no voice rest—no voice therapy—smoking—breakdown of suture line)
22	45	N	N	N	Wendler + RAA	N
23	49	N	N	N	Wendler	N
24	55	N	Y	N	Wendler	N
25	56	N	N	N	Wendler	N
26	56	N	N	N	Wendler	N
27	45	N	Y	N	Wendler	N
28	59	N	N	N	Wendler	N
29	50	Y	N	N	Wendler	N
30	52	N	N	N	Wendler + RAA	N
31	48	N	N	N	Wendler	N

Abbreviations: Y, yes; N, no; RAA, reduction of Adam's apple.

Statistics

Statistical analysis was performed with *IBM SPSS 20*. Summary of descriptive statistics are presented as mean \pm standard deviation (SD) for continuous variables. Changes in scores before and after intervention were assessed with paired *t* test or Wilcoxon signed rank test, as appropriate. All statistical tests were carried out at the two sided 5% level of significance.

RESULTS

All individuals underwent Wendler glottoplasty with minor modification, in terms of de-epithelialization of the anterior part of the vocal folds by using CO₂ laser instead of cold instru-

ments, as was first introduced by Wendler. Ten transsexuals (32.2%) underwent simultaneously Adam's apple reduction operation for a more feminine appearance; eight of them (25.8%) were from group A. Three (9.7%) individuals also from group A had been previously undergone a cricothyroid approximation (type IV thyroplasty). In one of them along with the glottoplasty, a resection of a fistula at the level of the skin incision and of a foreign body granuloma was performed. The granuloma was developed around fragments of silicone used to reinforce the stitches.

A revision Wendler procedure was necessary for three individuals (9.7%); two of them presented a suture's line breakdown because they did not follow the postoperative

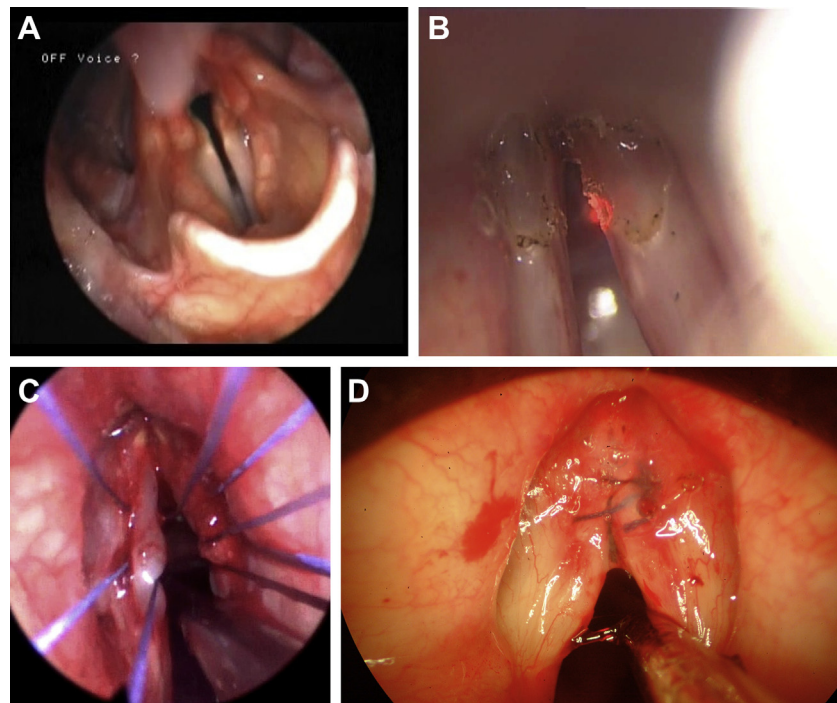


FIGURE 1. (A–D). A case of Wendler glottoplasty (A. preoperatively, B. ablation of epithelium, C. setting of the threads, D. tightening of the threads and fibrin glue placement).

recommendations for voice rest and the third one had an insufficient web due to an insufficient estimation of the necessary correction (Table 1).

Table 2 shows the pre- and postoperative values (mean \pm SD) of voice parameters as well as the statistical significance after comparison. Mean F_0 presented significant improvement in total from 135.8 to 206.3 Hz ($P = 0.001$). Both groups revealed improvement of F_0 , but it was more evident in group A (mean F_0 -postop = 213.8 Hz). The mean frequency range had a tendency to decrease after operation, especially in group B, from 345 to 227.6 Hz, but without statistical significance.

MPT and PQ were almost unchanged with minor differences in the mean pre- and postoperative values in all groups. ESGP was significantly higher in total and in group A with postoperative values of 11 ± 3 and 11.2 ± 3.1 , respectively ($P = 0.001$). VHI score was slightly increased postoperatively (mean value 47.71 vs 54.6), especially in group B (mean value 60 vs 81.4) but without significance. G was increased postoperatively in group B presented statistical significance ($G_{pre} = 0.1 \pm 0.3$, $G_{post} = 0.6 \pm 0.5$, $P = 0.035$).

DISCUSSION

Voice constitutes a major characteristic of human identity. Discrepancy between the voice and the new appearance is a major obstacle to complete social acceptance after successful sex-reassignment surgery in MFT patients, causing embarrassment and psychological suffering.

Many options have been provided to feminize the voice. Some therapists rely on voice therapy and others on surgical procedures. Speech therapy has the advantage of being a noninvasive method, helping MFT patients not only to adapt their voice but also their behavior so as to identify with the female gender instead of training them just to raise their pitch. Parameters, such as breathiness, intonation, articulation, word choice, and inflexion are also important voice characteristics and play a major role in discriminating male versus female voices. However, MFT patients are often dissatisfied with speech therapy alone.⁵

Among the voice parameters, pitch has been considered as the most important of all for feminine perception and several studies have shown that a mean F_0 of 155 to 160 Hz could be regarded as the critical threshold for that purpose.^{12–14} F_0 is determined by the tension, mass, and length of the vocal

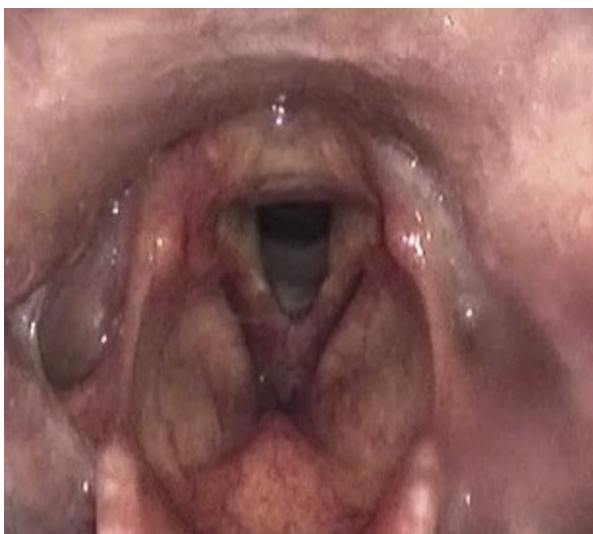


FIGURE 2. Postoperative anterior web formation after 2 months.

TABLE 2.
Voice Assessment in MFTs Before and After Glottoplasty

Variables	Total (n = 29)	Group A (n = 17)	Group B (n = 12)
F_0 (Hz) (mean \pm SD)			
Preop values	135.8 \pm 41.5	132.8 \pm 41.3	143.8 \pm 45.4
Postop values	206.3 \pm 43.9	213.8 \pm 42.8	187 \pm 45.2
<i>P</i> value*	0.001	0.001	0.003
Frequency range (Hz) (mean \pm SD)			
Preop values	349.2 \pm 164	350.9 \pm 184.8	345 \pm 108.6
Postop values	313 \pm 170	345.8 \pm 174.3	227.6 \pm 138
<i>P</i> value*	0.8	0.8	0.4
MPT (s) (mean \pm SD)			
Preop values	14.4 \pm 6	14 \pm 6.6	15.6 \pm 4.3
Postop values	13.3 \pm 7.4	13.1 \pm 8	13.9 \pm 6
<i>P</i> value*	0.6	0.9	0.09
PQ (mL/s) (mean \pm SD)			
Preop values	274 \pm 200	305.7 \pm 221	192 \pm 108.9
Postop values	283.8 \pm 206.7	295 \pm 204.5	255 \pm 233.7
<i>P</i> value*	0.7	0.8	0.15
ESGP (hPa) (mean \pm SD)			
Preop values	8 \pm 2.9	7.3 \pm 2.2	9.2 \pm 3.7
Postop values	11 \pm 3	11.2 \pm 3.1	10.7 \pm 3
<i>P</i> value*	0.001	0.001	0.322
VHI [median (min–max)]			
Preop values	32 (0–113)	44 (0–81)	28 (0–113)
Postop values	37.5 (0–102)	42 (16–100)	34 (0–102)
<i>P</i> value†	0.2	0.9	0.139
G (mean \pm SD)			
Preop values	0.2 \pm 0.7	0.3 \pm 0.8	0.1 \pm 0.3
Postop values	0.4 \pm 0.5	0.4 \pm 0.5	0.6 \pm 0.54
<i>P</i> value*	0.16	0.6	0.035

Abbreviations: F_0 , fundamental frequency; preop, preoperative; postop, postoperative; MFR, mean frequency range; MPT, maximum phonation time; PQ, phonation quotient; ESGP, estimated glottic pressure; G, grade (GRBAS scale); VHI, voice handicap index; group A, individuals <40 y old; group B, individuals >40 y old.

* Paired *t* test.

† Wilcoxon test.

folds. Various surgical techniques have been described aiming to achieve a higher voice pitch by modifying one of the aforementioned characteristics: CTA or anterior commissure advancement (ACA) for increasing the tension; scarification, steroids injection, or CO₂ vaporization for mass alteration; and vocal fold shortening by plication or anterior webbing. CTA is the most well-known method and after its introduction by Isshiki⁷ has been modified by many surgeons. In the series of Neumann and Welzel,⁶ 67 MFTs underwent a modified CTA with the use of nonresorbable miniplates for reinforcing the stitches. The authors claimed that 1 year after operation, the functional results were good and the F_0 had been raised by about one-fourth. However, only 30% of their patients presented voices within the female range and 32% had a neutral-sounding voice. Kanagalingam et al¹⁵ presented a modification of CTA with subluxation of the thyroid cartilage forward over the cricoid cartilage to further increase vocal fold tension. In their series of 21 patients, after a median follow-up of 6 months, they claimed an overall postoperative gain in modal frequency of free speech of 56.9 Hz. There was a concomitant rise of 9.9%

postoperatively in voice irregularities, but it was effectively addressed after six sessions of speech therapy. Van Borsel¹⁶ tried to further investigate the efficacy of CTA in feminizing the voice from a perceptual perspective. The conclusion of this study was that CTA is a possible option to raise the voice pitch in MFTs, but it may not be sufficient alone to create a voice fully perceived as female.

Similar increased tension is achieved also by ACA laryngoplasty as introduced by LeJeune et al¹⁷ and modified by Tucker.¹⁸ Wagner et al¹⁹ reported 14 MFT patients who underwent ACA, CTA, or both, after inadequate voice therapy alone. The median follow-up period in this study was 6.5 months. Results were evaluated subjectively by the patients and objectively by the speech therapists and presented success rates of 78.5% and 71.5%, respectively. The usual maximal and minimal frequencies increased significantly and the median postoperative gain in usual F_0 was 11 Hz.

All the aforementioned studies usually presented good early results; however, many of MFTs remained disappointed after these procedures because unfortunately pitch decline occurred

after 6–18 months. Many reasons could possibly explain such an outcome: mechanical factors that may limit a permanent pitch elevation due to gradual relaxation of the induced vocal fold tension over time; laryngeal anatomy which is actually inconsistent with female measures; and a subjective or population bias in voice perception or its alteration. Other main disadvantages of these procedures are external incision and accentuation of the thyroid notch.⁵

Vocal fold stripping and injection of the vocal fold with a steroid suspension have also been used to a limited extent.²⁰ Nevertheless, evidence of the efficiency of such procedures is limited and, mostly, based to a few case reports. Orloff *et al*²¹ described a laser-assisted voice adjustment (LAVA) technique on 31 MFTs with androphonia. Many of them had previous phonosurgery or speech therapy at other centers. The technique is based on the vaporization of the vocal fold 1–2 mm lateral to the free edge extending along the superior surface of the vocal fold from the vocal process to as far anterior as possible. The authors reported a mean pitch elevation of 26 Hz. Self-assessments revealed increases in voice femininity, congruity with self-image and satisfaction. However, the evaluations also showed decreased vocal quality, loudness, and vocal range probably because of the vaporization technique performed.⁵ In another series, Kocak *et al*²² describes the use of a modified LAVA technique called laser reduction glottoplasty (LRG), in patients with unsatisfactory outcomes after CTA. LRG is based on the CO₂-assisted laser longitudinal vaporization of the cover, the vocal ligament lateral and medial layers of the vocal muscle through nonvibrating site of vocal folds, and on the medial tensioning and stabilization of the vibrating part of the vocal folds with sutures. In that way, the vocal fold mass was reduced to the female size. This method provided an additional mean gain of 45.17 Hz and all patients reported satisfactory female voice quality and greetings with female salutations in nonvisual communications. The authors claimed also that the voice-related quality of life measures were significantly elevated after LRG. The follow-up was of 1 year. However, half of the vocal folds mass being vaporized, quality of the healing process, extent of a possible scarring, and long-term atrophy cannot be anticipated.

Wendler technique relies on de-epithelialization of only the anterior third of the vocal folds and suture in a V shape, shortening of the vocal folds, and reduction of the vocal folds vibrating mass. In our experience, rest or effort breathing was not affected by the narrowing of the endolaryngeal lumen. Temporary postoperative hoarseness can be observed for a few weeks but is corrected by speech therapy. The main advantage is the permanence of the web when obtained and of the voice results.

Gross² reported with a similar technique, a reduced voice range for the lower frequencies and an increase of the usual frequency (mean-pre = 116.8 Hz, mean-post = 201.0 Hz) on a series of 10 transsexuals aged between 30 and 57 years with a follow-up ranging between 35 and 45 months.

Our attempt to divide the patients' series in two groups according to age had a reasonable background since our experience with this operation over years led us to believe that younger individuals presented better results. The limit of 40

years was subjective, based mainly to the fact that older individuals in the fifth decade of their life, who choose to alter their image to a female one, have already a developed male body and the outlook of a male personality. Some of them even fought this strong feeling by overplaying the male role. Changing the body and behavior from male to female is then more difficult, what is also true for the voicing.

In our series, the mean F_0 presented the bigger increase in group A (mean increase of 81 Hz). The mean frequency range was decreased postoperatively but without significance. This must be attributed to the small series of individuals, but however, with a good trend. ESGP was found significantly increased in both total patients and group A and this is attributed mainly to the higher subglottic pressure necessary to trigger the vocal folds vibration due to their postoperative stiffness. This increase of the vocal effort and the drop in frequency range were not felt by the majority of our individuals, who were young and nonprofessional voice users. However, worsening of G was significant ($P = 0.035$) particularly in group B. This could be explained by the temporary postoperative hoarseness.

Subjectively, the individuals did not notice a statistically significant improvement using the VHI questionnaire, as indicated from the changes in mean values. Moreover, subjective evaluation varied widely among the individuals enrolled in the study. This heterogeneity was reflected in the high dispersion of VHI values, which, in addition to the relatively small sample size, could lead to inaccurate general conclusions concerning their overall satisfaction, which should always be evaluated taking into account the particular characteristics of this population groups. For example, although not significant, the VHI score revealed increased postoperative values especially in group B. This could be attributed to a possible lack of sensitivity of VHI for such a group of individuals and also to the very high expectations often anticipated by transsexuals. Although they recognized the change in voice pitch and were pleased because they were accepted as women on the phone, this did not correspond to their expected female model with an F_0 higher than the mean female F_0 (200–215 Hz). Therefore, counseling is imperative to confirm that these patients have realistic expectations. It is also important to insist that all of them must have proper postoperative voice training for optimal long-term results and for learning gender-specific behavioral rules of communication.⁵ Nevertheless, we could think indeed that behaving like a female since many years would facilitate the overall identification of the individual as a female. But that would be a very good question for a future study.

Considering the possible weakness of VHI for such individuals, some researchers have reported on new questionnaires like Transgender Self-evaluation Questionnaire, and recently an extensive review of it called Transsexual Voice Questionnaire for Male-to-Female Transsexuals (MtF)-TVQ (MtFT).²³ This is a tool designed to measure the perceptions of MtF transsexuals regarding their voice and seems to be quite effective. We are intended to use it in our next studies.

The drawback of our series is that the follow-up period was variable from one to another individual. This variation in the follow-up is mainly due to the geographical distance of some

of them from the hospital (ie, individuals from abroad), the lack of compliance and the financial issues, the individuals being given no financial cover for this type of treatment. Thus, it was difficult to have a regular 2-year follow-up from all these individuals.

We did not experience any major early or late complications related to the technique. Three cases underwent a revision glottoplasty. In two of them, there was an early breakdown of the suture line, probably because they did not respect the post-operative recommendations of an appropriate voice rest, which is paramount for a proper forming of the web. In the third case, the web obtained was insufficient to raise the pitch properly.

Our results support our initial consideration that the younger transsexuals can benefit more than the older ones from the glottoplasty procedure, achieving better voice outcome. This is a transoral method with good results regarding increased F_0 . Conclusively, we can propose this technique as a safe and efficient alternative. A longer follow-up is needed.

CONCLUSION

Laryngeal surgery can contribute to the voice feminization process in transsexuals. Among the possible procedures, Wendler glottoplasty can be proposed as a safe and minimally invasive method with good results. Special care should be taken for not de-epithelializing more than the anterior third of the vocal folds. Postoperative voice rest is mandatory for a good outcome. Speech therapy is necessary to modify the vocal behavior. Younger transsexuals can benefit more from this technique. Counseling is imperative to verify that patients have realistic expectations.

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